



NASA

Studies of shuttle design focus on differences between simpler straight wing and more complex delta wing.

a competitive space program, the cost of earth-to-orbit launch must be reduced from the current \$1,000 per payload pound to about \$100 per pound by replacing the expendable boosters (of all shapes) with a single, versatile, reusable one.

But the problem is not that simple. The Air Force is counting on NASA to make up for what the Air Force lost by cancellation of its Dynasoar and Manned Orbiting Laboratory programs. And the Air Force requirements are more stringent. They include a vehicle that is more maneuverable laterally once it reenters the atmosphere, and probably greater payload capacity. Since NASA is counting on multiple uses of the new bird—scientific, civilian and military—to get its program funded, the result is a constantly changing shuttle picture with a growing list of base line requirements. These requirements will determine a basic design question—whether the shuttle will have a straight wing or a delta wing.

And each day, more points are being claimed for the more complex delta wing.

The straight wing, which originated at NASA's Manned Spacecraft Center in Houston, was conceived as the simplest approach to getting into orbit and back again. Its design arose out of the original NASA requirements for a low cross-range vehicle—one less maneuverable than the Air Force needs. "MSC looks at a configuration as though we are going to have to build and fly it," says Christopher C. Kraft, assistant director of the center. "Our approach was to find the simplest path through the technical maze . . . find out where the problems were and try to avoid them rather than solve them." But a limited space budget and Air Force requirements place the straight wing in a new perspective.

Since the overall requirements for the shuttle are still in a state of flux, so is the design. "We are committed only to building the best vehicle for all purposes," says Kraft.

"Aerodynamically, the flight regime of the straight wing," says Maxime A. Faget, the father of the design, "is much more completely understood." It uses a traditional fuselage design compared with the complex delta shape.

The major differences appear in flight speeds and heating loads.

The delta, tested extensively in the Dynasoar program, has better hypersonic and supersonic characteristics and fulfills Air Force needs; the straight wing can maneuver better subsonically. "The problem," says Faget, "is getting a 1,250- to 1,500-mile cross-range out of the straight wing." The question is: At what point after entering the earth's atmosphere and traveling hypersonically cross-range does the straight wing become technically inferior to the delta?

According to some wind tunnel heating statistics, the delta can maneuver up to 1,500 miles laterally. Because of its shape and angle of attack, its temperatures reach only about 3,000 degrees F. The straight wing, on the other hand, nears temperatures of 4,200 degrees F. Since the shuttle's economy depends on its reusability, a heat shield system must be designed to either withstand such temperatures or be economically replaced.

The current requirements are for a vehicle that can launch 25,000-pound payloads (although the Air Force may require greater payload capacity) to a 270-nautical-mile (space station) orbit at an inclination of 55 degrees. In addition to the studies examining the two-

stage vehicle (booster and orbiter), several studies are looking at a stage-and-a-half shuttle—a single vehicle in which the fuel tanks would be dropped after launch.

Other questions yet to be resolved include the manned versus unmanned booster. If the two-staged shuttle is chosen, two vehicles will launch vertically simultaneously. This introduces abort and safety problems not encountered in the Apollo staging. An unmanned booster would permit concentration of crew safety on the orbiter. The booster could, according to drone proponents, land automatically.

Another area of pending decision is the desirability of having air-breathing engines on the orbiter for use after reentry. The engines would be needed, says Clarence Gay of the space station office at NASA headquarters, during initial flight tests. Later, if the engines were dropped, 16,800 pounds of payload capacity could be added.

How the shuttle develops, however, may not depend on either the Air Force or NASA but on Congress. The already dwindled space budget was vetoed and faces another round of debates in Congress before January. The shuttle is the prime target of some cost-cutting opponents. □

TARNISHED IMAGE

Assessing the campaigners

As winners and losers of both parties were taking stock of last week's off-year elections, some of the deepest soul-searching was to be found among political consultants—the new breed of campaign managers that many observers believe to have revolutionized electioneering in the United States.

Some behavioral scientists had not quite accepted the thesis of a revolutionary role of TV, computers, polling and communications theory in determining who gets elected. The response (see p. 378) of Dr. Bruce H. Westley of the University of Kentucky to an earlier story on campaign consultants (SN: 9/12, p. 229) was written before the returns were in. Such professional skeptics were joined by much of the nation's press and perhaps a number of politicians after the election. The re-

sults clearly showed that having a professional political consultant, even one of the best, was not a magical way to win at the polls.

The basic question, as Dr. Westley points out, is how much influence the mass media have over the voters—how effective they are in persuading people to vote one way or the other. And it is on this basic question that much theory about the process of communications and persuasion is still not clear.

One of the keystones of communications theory was laid down in the 1940's and 1950's, when studies of the spread of information concerning everything from Presidential candidates to refrigerators to new drugs indicated that there were two steps in the process. The mass media, this research suggested, were not the major means by

which most people were informed and influenced. Instead, the major source of information and influence was the opinion leader—a person of the same socioeconomic level who spread information and persuasion among his peers.

This two-step theory of communication, as it is called, is still current, although some theoreticians, Dr. Westley among them, argue that the search for particular opinion leaders among peer groups is a false one. What happens, he says, is that most people gain much of their information from the mass media, but when they come to make decisions they tend to make them on the basis of interaction with others—their family, friends, people of like opinion.

"I don't think there's any question that the mass media provide some important things for decision making," he says. "First of all, the agenda, if you will, for your personal discussion, and the semantics, the terms and categories.

"But there's also no doubt about the importance of group validation in reaching decisions."

But the two-step process is one which many practitioners of the art will argue with, holding that the media have much more persuasive powers than they are given credit for.

And regardless of the outcome of the 1970 elections, there has undoubtedly been a substantial increase in the use of survey techniques, voter analysis and campaign planning since 1968. The trend is bound to continue.

"We certainly know a lot more about voters these days," says Dr. David Rosenbloom of Hamilton College in Clinton, N.Y. "But my preliminary impression is that some consultants made some phenomenal blunders." He cites as examples the race run by Sen. Ralph Smith (R-Ill.) against Adlai Stevenson III, in which a campaign to tag Stevenson as a super-liberal backfired, and the Senate campaign of Rep. Richard Ottinger (D-N.Y.), which was laid out early to combat fellow liberal Sen. Charles Goodell (R-N.Y.) and was unable to stave off the challenge of Conservative William Buckley.

There is no doubt, says Dr. Rosenbloom, that campaigners have more accurate information, and more kinds of information, about the voters than they ever had before, and that they are making campaign decisions based on the additional information. But their ability to use it still depends on how smart they are.

"Before," says Dr. Rosenbloom, "campaigners were making stupid decisions on the basis of little or no information. Now they can make stupid decisions on the basis of a lot more information." □

LEAD HAZARD

Consumers and the earthenware problem

What some have termed today's consumer revolution is sometimes merely a newly sensitized awareness by the general public of safety hazards and manufacturing deficiencies in the products they buy. Often lacking is the ability to do much about the problem.

A case in point is the recent uneasiness about the possible dangers of lead poisoning from certain kinds of earthenware used as food containers. Recent medical cases and a widely publicized scientific report (SN: 10/10, p. 301) on the subject have prompted new concern among persons wondering how they can know if the earthenware pottery they buy is safe.

Unfortunately, say those knowledgeable about the subject, there is no simple answer. Earthenware dishes, pots and pitchers come from a wide variety of sources, each requiring a different avenue for safeguarding the potential consumer.

Many large domestic manufacturers belong to the U.S. Potters Association, which maintains strict standards for the amount of lead release permissible. The maximum is seven parts per million. Though this number is quite safe, a spokesman for the association says it strives to keep the level at five or fewer parts per million. In January the association began granting a seal of approval to all products meeting their standards, from both member and non-member manufacturers. To earn this seal, a manufacturer must submit samples of his earthenware every six months to a certain independent testing laboratory. Since this program is new, however, some manufacturers whose programs pass muster have not yet received seals.

The Food and Drug Administration is responsible for testing imported earthenware and has considerably expanded its program for examining such products. The FDA is also empowered to confiscate domestically manufactured earthenware releasing more than seven parts per million lead, if it is shipped in interstate commerce. But such measures are of only limited help, the FDA acknowledges.

Nevertheless the efforts of the Potters Association and the FDA may eventually guarantee the safety of imported earthenware and earthenware from large domestic manufacturers. But the rise in popularity of pottery making as a hobby in recent years has seen a huge proliferation of earthenware produced by amateurs.

The amount of lead released by a glaze depends on a number of things—the glaze's lead content, the temperature at which the pottery is fired and the

time of firing. Most amateur potters use the glazes to obtain an attractive shiny surface, but they may not be skilled or knowledgeable enough to maintain just the right firing conditions. Since many of these products are not shipped in interstate commerce, the FDA has no legal jurisdiction over them.

One possible solution is for the manufacturers of hobby glazes to label their products with the exact firing conditions necessary for a safe product. The National Ceramics Manufacturers Association is currently campaigning for this. The FDA may then have jurisdiction over such labeling and could ensure its accuracy.

Another possibility, suggested by an FDA official, would be to make available to the general public the testing kit the FDA uses to determine lead release of imports. Hobbyists and small manufacturers could apply this test to their finished products to determine their safety for use as containers for food and liquids. □

SCIENCE NEWSBRIEFS

Lasker Awards

For pioneering work in bone marrow transplantation and for research achievements in processes of hormone regulation, two scientists last week received the Lasker Awards for 1970, the United States most revered prizes in medicine and biology.

The Albert Lasker Award for distinguished work in clinical medical research, carrying a \$10,000 stipend, was presented to Dr. Robert A. Good of the University of Minnesota. The jury emphasized his feat of transplanting bone marrow cells into immunologically deficient children (SN: 10/18/69, p. 358). Work elucidating the function of cyclic AMP, which mediates hormone activity throughout the body, earned Dr. Earl W. Sutherland of Vanderbilt University School of Medicine in Nashville the \$10,000 prize for basic medical research. □

Environment administrator

President Nixon last week nominated William D. Ruckelshaus, now an assistant attorney general, to be head of the new Environmental Protection Agency, scheduled to become a reality in December.

Ruckelshaus immediately involved himself in a current environmental controversy: whether the Internal Revenue Service should allow continued tax exemption for environmental and other public interest organizations. IRS should continue the exemption, he said. □